

WHAT IS CLAIMED IS:

1. A semiconductor device, wherein a gap is formed between wirings formed on a substrate, and the gap is filled with gas having a thermal conductivity equal to or 5 higher than three times that of air at 0°C.
2. A semiconductor device according to claim 1, wherein said gas is one of helium gas and hydrogen gas.
- 10 3. A semiconductor device according to claim 1, wherein a gas impermeable film through which said gas cannot be permeated is formed on the wiring and above the gap.
- 15 4. A semiconductor device according to claim 1, wherein a gas permeable film through which said gas can be permeated is formed on the wiring and above the gap, and a gas impermeable film through which said gas cannot be permeated is formed on the gas permeable film.
- 20 5. A wiring forming method in a semiconductor device, comprising the steps of:
 - (A) forming a wiring and a filling layer filled between wirings, on a substrate;
 - 25 (B) forming a gas permeable film on the wiring and the filling layer;
 - (C) removing the filling layer through the gas permeable film so as to form a gap between the wirings;
 - (D) filling a gas having a thermal conductivity 30 equal to or higher than three times that of air at 0°C through the gas permeable film into the gap; and

(E) forming a gas impermeable film on the gas permeable film.

6. A wiring forming method in a semiconductor
5 device according to claim 5, wherein said gas permeable
film is made of a porous insulation material, and
said gas impermeable film is made of silicon nitride.

7. A wiring forming method in a semiconductor
10 device according to claim 5, wherein said gas one of is
helium gas and hydrogen gas.

8. A wiring forming method in a semiconductor device, comprising the steps of:

15 (A) forming a plurality of wirings on a substrate;
and

(B) forming a gas impermeable film on the wirings and above gaps existing between the wirings, in gas atmosphere having a thermal conductivity equal to or higher than three times that of air at 0°C.

9. A wiring forming method in a semiconductor device according to claim 8, wherein said gas impermeable film is made of a polyimide film.

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10. A wiring forming method in a semiconductor device according to claim 8, wherein said gas is one of helium gas and hydrogen gas.

30 11. A wiring forming method in a semiconductor device, comprising the steps of:

- (A) forming a plurality of wirings on a substrate;
- (B) forming a gas permeable film on the wirings and above gaps existing between the wirings;
- (C) filling a gas having a thermal conductivity equal to or higher than three times that of air at 0°C through the gas permeable films into the gaps; and
- (D) forming a gas impermeable film on the gas permeable film.

10 12. A wiring forming method in a semiconductor device according to claim 11, wherein said gas permeable film is made of one of silicon oxide film and a low dielectric constant film; and
said gas impermeable film is made of silicon nitride.

15 13. A wiring forming method in a semiconductor device according to claim 11, wherein said gas is one of helium gas and hydrogen gas.